

HYDRAULIC ROD JAR

Instruction Manual 4010



Hydraulic Rod Jar

Hydraulic Rod Jar

INDEX

Hydraulic Rod Jar

General Description	3
Use	3
Explanation of Mechanism	3
Operation	3
Disassembly	4
Reassembly	4
Testing	5
Strength Data	5
Specifications and Replacement Parts	6 – 7

The designs and specifications for the tools described in this instruction manual were in effect at the time this manual was approved for printing. National Oilwell Varco, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change designs and specifications without notice or without incurring obligation.

Sixteenth printing, March 2006

General Description

Bowen® Hydraulic Rod Jars provide a means for dependable, controlled jarring whenever required in sucker rod operations where electrical continuity or circulation is not required. A simple hydraulic system, comparable to the well known Bowen® Hydraulic Rotary Jar, is employed in the Bowen® Hydraulic Rod Jar which permits the operator to control the intensity of the blow within very wide ranges. The Bowen® Hydraulic Rod Jar can be controlled to deliver a light blow or a very hard blow.

Use

Bowen® Hydraulic Rod Jars may be used in any sucker rod operation that does not require electrical continuity or circulation to the tools or equipment below the jar. These operations would include fishing jobs and other related services.

Explanation of Mechanism

The Bowen® Hydraulic Rod Jar consists essentially of a sliding Mandrel within a hydraulic chamber. When the jar is in the closed position, an integral piston on the lower end of the Mandrel rests in the Middle Body cylinder of restricted clearance.

When an upward strain is taken on the string, the Top Sub and Mandrel are pulled upward with respect to the Body Assembly. The Piston, moving upward within the cylinder, is impeded by the hydraulic fluid.

The hydraulic fluid, now under pressure from the Piston, tries to flow from above the Piston to below but is restricted in its flow by the extremely narrow annular passage between the Piston and the cylinder wall. This very close fit retards the fluid flow, delaying the completion of the jarring stroke until a sufficient strain has been taken on the string to produce a blow of the required intensity.

As soon as the Piston passes from the restricted cylinder into the enlarged cylinder, the fluid resistance ceases. The Top Sub and Mandrel travel upward at greatly accelerated speed until the Piston strikes the Mandrel Body, transmitting a jarring force proportional to the strain taken on the string.

After the jarring stroke, slacking off the string allows the Bowen® Hydraulic Rod Jar to close. A one-way Check Valve in the Piston permits free passage of the fluid on the closing stroke.

The Jar will deliver full torque in the string while in the open or closed position.

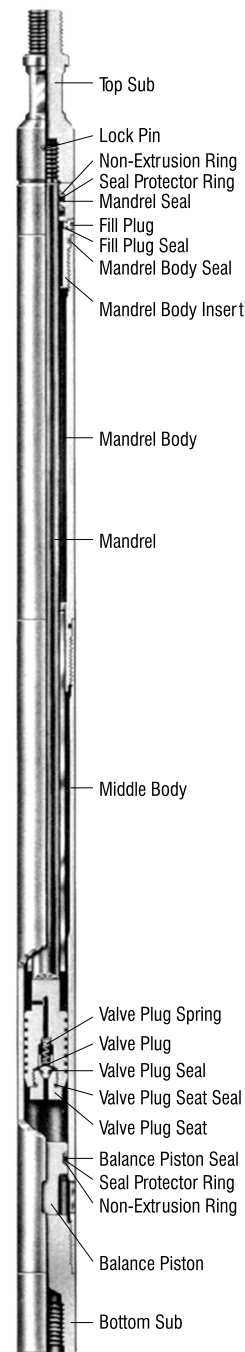
A sliding Balance Piston near the lower end of the Middle Body provides the volume equalization necessary to the functioning of the Jar's hydraulic system. Bowen® patented Seal Ring Assemblies prevent any leakage around the Balance Piston. A Bowen® Seal is located in the Mandrel Body Insert sealing off the Mandrel. Each Bowen® Hydraulic Rod Jar is provided with a fishing neck on the Top Sub.

Operation

The Bowen® Hydraulic Rod Jar is made up in the string just above the tools or equipment to be run.

The assembled tools are run into the well on the sucker rod in the normal manner and the fish or equipment is engaged.

An upward strain is taken on the string by pulling upward. Then set the string and wait for the jar to strike a blow. After the jar has struck, slack off sufficiently to allow the jar to close; then repeat the jarring by pulling another strain on the string. The frequency of blows struck may be as rapid as the operator can pick up and slack off the running string.



Hydraulic Rod Jar

To increase the intensity of the jarring blow, take a greater strain on the string. To lessen the intensity of the jarring blow, take a lighter strain on the string. Bowen® Hydraulic Rod Jars are run into and out of the well on sucker rods just like any other Rod tool. No special precautions are necessary. Zero point or measurement reference should take into account the length of the stroke of the jar; this information is given in the Specification Table.

High temperature seals are available for high temperature service.

Disassembly

1. Secure the jar in a suitable vise at the Middle Body.
2. Remove the Bottom Sub from the Middle Body.
3. Remove Fill Plug from the Mandrel Body Insert, allowing oil to drain from Jar.
4. Back off Mandrel Body Insert from Mandrel Body.
5. Back off Mandrel Body from Middle Body.
6. Withdraw assembly of Top Sub, Mandrel Body Insert, Mandrel Body, Mandrel and Piston from Middle Body.
7. Remove Balance Piston from Middle Body by forcing it out the bottom with a dowel rod.
8. Remove Middle Body from vise.
9. Secure the Mandrel Assembly in the vise, anchoring it by the Top Sub.
10. Unscrew Valve Plug and remove Check Valve Assembly from the Piston.

11. Using a drift punch, remove the Lock Pin from the Top Sub. Back off and remove Mandrel from the Top Sub.

CAUTION: Use a wrench only on the wrench flats provided. Any gouges or upsets on the finished Mandrel surface will cause loss of seals and leakage of fluid.

12. Slide Mandrel Body Insert and Mandrel Body off over the threaded end of the Mandrel. **NOTE:** Clamp the Mandrel Body Insert in a vise and remove the Insert Bushing from it (where applicable.)

13. Remove all O-Ring Seals, Seal Protector and Non-Extrusion Rings.

Reassembly

All parts should be thoroughly cleaned, then lubricated with a lightweight oil. Carefully examine the Non-Extrusion Rings and Seal Protector Rings for any damage. If damaged, they should be replaced with new rings. Remove any burrs or nicks on Non-Extrusion Rings with a small hand file.

1. Insert Non-Extrusion Rings into their beveled grooves in the Mandrel Body Insert and on the Balance Piston. Make sure that the bevel of the ring matches the bevel of the grooves. Press firmly into place with the thumbs.
2. Insert Seal Protector Rings on the inside surface of each Non-Extrusion Ring. Press and straighten into place with the thumbs.
3. Insert O-Rings between or next to the Seal Protector Ring.
4. After Seal Ring Assemblies have been properly positioned, set them in place by using the proper Setting Tool and tapping the Setting Tool around its periphery.

5. Insert O-Ring on Mandrel Body Insert. Screw the Insert Bushing into the Mandrel Body Insert (where applicable). Make up Mandrel Body Insert in Mandrel Body.

6. Slide Mandrel Body Insert and Mandrel Body carefully over threaded end of the Mandrel.

7. Secure the Top Sub in a vise, then make up Mandrel to the Top Sub using the wrench flats provided.

8. Insert the Lock Pin into the Top Sub and through the mandrel end. Drive it in with a light hammer until it is flush with the Top Sub OD.

9. Install Check Valve Assembly in the Piston on the end of the Mandrel.

10. Make up Middle Body to Mandrel Body. Insert Fill Plug in the Mandrel Body Insert. Remove from vise.

11. Secure assembly in the vise in a vertical position with the Top Sub down and the jar in its open position or at the top of its stroke.

12. Pour an approved ISO grade 22 hydraulic oil into the Middle Body until the oil overflows through the equalizing holes. **NOTE: If heavier jarring blows are desired, the Jar may be filled with a heavier weight oil.**

13. Place Balance Piston into Middle Body.

14. Make up the Bottom Sub to the Middle Body hand tight.

15. Place assembly in a horizontal position in the vise with the Fill Plug up. Remove the Fill Plug. Tighten the Bottom Sub.

16. Close the Jar slowly. When completely closed, insert the Fill Plug.

Testing

The Jar can best be tested for operation by making up a lifting type sub with a bail (or equivalent) to the Top Sub. Make up another sub to the Bottom Sub to which an 850 lb. weight can be attached.

Obtain a dead weight of approximately 850 lbs. The usual method is to hang the Jar on a 2,000 lb. minimum capacity hoist, with the weight suspended from the Bottom Sub of the Jar. The hoist is slacked off until the weight rests on the floor and the Jar closes. The Jar and weight are then hoisted rapidly until the weight is raised off the floor by a height equal to the stroke of the Jar, less 1 or 2 inches. As soon as the load is lifted, begin checking the time required for the Jar to stroke open.

The chart below lists approximate time lapse for standard Rod Jars, under a fixed pull load.

Hydraulic Rod Jar Load and Time Recommendations

Jar O.D.	Load in lbs	Time Required to Stroke
1-1/2	850	1 min to 2 min
1-3/4	850	1-1/2 min to 2-1/2 min
2-1/8	850	2 min to 3 min

CAUTION: This method should not be employed using a hoist of less than 1 ton (2,000 lb.) capacity, as there is danger of damage to the hoist or injury to operating personnel if the hoist is too light.

If leaks are detected at the seals, or if the Jar is low on fluid, the tool should be disassembled for repair.

Bowen® Hydraulic Rod Jars Strength Data and Recommended Tightening Torque

Jar Assembly Number	O.D. (in)	Top Sub to Mandrel	Tightening Torque (ft-lbs)				Strength Data		
			Insert Bushing to Mandrel Body Insert	Mandrel Body Insert to Mandrel Body	Mandrel Body to Middle Body	Middle Body to Bottom Sub	Max. Recommended Jarring Load (lbs)	Calculated Max. Lift Load After Jarring @ Yield Point (lbs)	Calculated Torque @ Yield Point (ft-lbs)
28591	1-1/2	75	—	210	210	300	9,200	37,500	150
79316	1-3/4	135	230	390	390	440	15,500	54,500	270
13570	2-1/8	325	—	690	690	800	21,000	92,500	650

The above makeup torques are the maximum recommended makeup torques for each connection and are set at 50% of the calculated theoretical yield torque.

The above tensile strength is a calculate theoretical yield point and is considered accurate to $\pm 20\%$.

Hydraulic Rod Jar Specifications and Replacement Parts

Outside Diameter		1-1/2	1-3/4	2-1/8
Connections		15/16	3/4	7/8
		10 Thd	SR	SR
Total Stroke (in)		8-3/16	10	11-1/8
Length Closed		38-15/16	42-3/8	64-1/8
Complete Assembly	Part No.	28591	79316	13570
	Weight	17	22	39

Replacement Parts

Top Sub	Part No.	10761	12761	11543
	Weight	1-3/4	2	4
Mandrel Body Insert	Part No.	28594	79317	10723
	Weight	1-1/4	1-1/2	3
Mandrel Body	Part No.	28593	12763	13572
	Weight	4	4-1/2	7
Mandrel	Part No.	28592	79318	13571
	Weight	5	6	11-1/2
Middle Body	Part No.	11182	12765	11537
	Weight	5	5-1/2	8-1/2
Balance Piston	Part No.	11185	12766	11540
	Weight	1/2	1/2	1/2
Bottom Sub	Part No.	11181	12767	11536
	Weight	1-1/2	1-3/4	3-1/2
Valve Plug	Part No.	11189	11189	11189
	Weight	1/4	1/4	1/4
Valve Plug Spring	Part No.	834	834	834
	Weight	1/100	1/100	1/100
Valve Plug Seat	Part No.	11186	11186	11186
	Weight	1/8	1/8	1/8
Mandrel Non-Extrusion Ring (2 Req'd.)	Part No.	365-15	365-17	365-21
	Weight	1/8	1/8	1/8
Mandrel Seal Protector Ring (2 Req'd.)	Part No.	375-15	375-17	375-21
	Weight	1/16	1/16	1/32
Balance Piston Non-Extrusion Ring	Part No.	366-16	366-20	366-24
	Weight	2	2	4
Balance Piston Seal Protector Ring	Part No.	82-16	82-20	82-24
	Weight	2	2	4
Fill Plug	Part No.	617	617	329
	Weight	1/8	1/8	1/8
Lock Pins	Part No.	13432	18183	42732
	Weight	1/16	1/16	1/8
Insert Bushing	Part No.	—	79319	—
	Weight	—	1/2	—

Hydraulic Rod Jar Specifications and Replacement Parts

Complete Assembly	Part No.	28591	79316	13570
-------------------	----------	-------	-------	-------

Replacement Parts (Continued)

O-Ring Packing Set	Part No.	32679	79328	13573
Consists of:	Weight	1/8	1/8	1/8
Mandrel Seal (2 Req'd.)	Part No.	568210	568212	568216
	Weight	1/32	1/32	1/32
Balance Piston Seal	Part No.	568211	568215	568219
				2 Req'd.
	Weight	1/32	1/32	1/32
Mandrel Body Insert - Small Seal	Part No.	—	—	568221
	Weight	—	—	1
Mandrel Body Insert - Large Seal	Part No.	568215	568218	568223
	Weight	1/32	1/32	1/32
Middle Body Seal	Part No.	568215	568218	568223
	Weight	1/32	1/32	1/32
Valve Plug Seal	Part No.	568007	568007	568007
	Weight	1/32	1/32	1/32
Fill Plug Seal	Part No.	568005	568005	568006
	Weight	1/32	1/32	1/32
Valve Plug Seat Seal	Part No.	568112	568112	568112
	Weight	1/32	1/32	1/32

Accessories - Extra

Jar Service Kit	Part No.	11178	15997	11554
	Weight	14	15	17
Mandrel Body Setting Tool	Part No.	22709-15	22709-17	22709-21
	Weight	3/4	1	1-1/2
Balance Piston Stem Setting Tool	Part No.	22729-16	22729-20	22729-24
	Weight	3/4	1	1-1/2

NOTE: Setting Tools are included in the Jar Service Kit, but may be purchased separately, if desired.

How to Order

Specify:

- (1) Name and number of assembly or part
- (2) Size and type of connections,
if other than standard

RECOMMENDED SPARES:

- (1) 1 Balance Piston
- (2) 1 Valve Plug
- (3) 3 Valve Plug Springs
- (4) 1 Valve Plug Seat
- (5) 4 Mandrel Non-Extrusion Rings
- (6) 4 Mandrel Seal Protector Rings
- (7) 4 Balance Piston Non-Extrusion Rings
- (8) 4 Balance Piston Seal Protector Rings
- (9) 2 Fill Plugs
- (10) 6 O-Rings Complete Packing Sets
- (11) 1 Jar Service Kit

Corporate Headquarters

10000 Richmond Avenue
Houston, Texas 77042
United States
Phone: 713 346 7500
Fax: 713 346 4493

California
4117 Atlas Court
Bakersfield, California 93308
United States
Phone: 661 395 0165
Toll Free: 800 328 0038
Fax: 661 328 1827

Louisiana
108 Nova Drive
P.O. Box 466
Broussard, Louisiana 70518
United States
Phone: 337 839 2400
Toll Free: 800 585 5697
Fax: 337 839 2211

190 Thompson Road
Houma, Louisiana 70363
United States
Phone: 985 851 1111
Fax: 985 851 1117

New Mexico
14 County Road 5860
P.O. Box 383
Farmington, New Mexico 87401
United States
Phone: 505 326 4303
Fax: 505 326 4304

North Dakota
3202 1st Avenue West
P.O. Box 731
Williston, North Dakota 58802
United States
Phone: 701 774 0091
Fax: 701 774 0092

Oklahoma
3800 Thomas Road
Oklahoma City, Oklahoma 73179
United States
Phone: 405 677 2484
Toll Free: 877 760 1711
Fax: 405 682 0147

Texas
2710 Highway 281 North
P.O. Box 801
Alice, Texas 78332
United States
Phone: 361 664 8013
Fax: 361 664 0462

2810 Highway 135 North
P.O. Box 1888
Kilgore, Texas 75662
United States
Phone: 903 984 2553
Fax: 903 984 7170

10720 West I-20 East
Odessa, Texas 79765
United States
Phone: 432 563 1173
Fax: 432 563 1182

30444 Southwest Freeway
P.O. Box 1595
Rosenberg, Texas 77471
United States
Phone: 281 341 5365
Toll Free: 800 248 8665
Fax: 281 344 1986

Utah
1553 East Highway 40
P.O. Box 482
Vernal, Utah 84078
United States
Phone: 435 789 0670
Fax: 435 789 6568

Wyoming
778 Circle Drive
Casper, Wyoming 82601
United States
Phone: 307 237 3100
Fax: 307 237 2546

Canada
540 5th Avenue SW, Suite 1010 (Office)
540 5th Avenue SW, Suite 1100 (Mailing)
Calgary, Alberta T2P 0M2
Canada
Toll Free: 877 645 8665
Fax: 403 294 5790

9118 34A Avenue
Edmonton, Alberta T6E 5P4
Canada
Phone: 780 944 3965
Fax: 780 461 4077

9120 34A Avenue
Edmonton, Alberta T6E 5P4
Canada
Phone: 780 702 5209
Fax: 780 463 2348

11453 98th Avenue
Grand Prairie, Alberta T8V 5S5
Canada
Phone: 780 539 9366
Fax: 780 539 9207

Germany
Eddesser Strasse 1
Edemissen Berkhöpen 31234
Germany
Phone: 49 5176 9767 0
Fax: 49 5176 9767 22

Indonesia
Cilandak Commercial Estate, Unit 105
Jalan Raya Cilandak KKO
P.O. Box 7541
Jakarta 12560
Indonesia
Phone: 6221 782 6088
Fax: 6221 782 6086

Jalan Mulawarman, No. 47 Rt. 32 Km. 20
Manggar, Balikpapan 76166
Indonesia
Phone: 62 542 772 114
Fax: 62 542 772 113

Malaysia
Menara Citibank, Level 36
165 Jalan Ampang
Kuala Lumpur 50450
Malaysia
Phone: 603 2169 6223
Fax: 603 2169 6224

Singapore
8 Sixth Lok Yang Road
Jurong Town
Singapore 628106
Phone: 65 6265 5066
Fax: 65 6265 7746

United Arab Emirates
R/A 13 Daimler Chrysler Street, Plot MO 0682
P.O. Box 61490
Jebel Ali Free Zone, Dubai
United Arab Emirates
Phone: 9714 883 8776
Fax: 9714 883 8795

United Kingdom
2 Isbourne Way
Winchcombe
Cheltenham, Gloucestershire GL54 5NS
England
Phone: 44 1242 603975
Fax: 44 1242 602614

Badentoy Cresent
Badentoy Park
Portlethen, Aberdeen AB12 4YD
Scotland
Phone: 44 1224 343610
Fax: 44 1224 878775

Unit 10 Kirkton Avenue
Pitmedden Road Industrial Estate
Dyce, Aberdeen AB21 0BF
Scotland
Phone: 44 1224 334800
Fax: 44 1224 723034

Manufacturing and Engineering Centers
3550 93rd Street
Edmonton, Alberta T6E 5N3
Canada
Phone: 780 944 3929
Fax: 780 430 0760

16211 Air Center Boulevard
Houston, Texas 77032
United States
Phone: 281 209 4840
Fax: 713 346 4493

Holton Road
Holton Heath Trading Estate
Poole, Dorset BH16 6LT
England
Phone: 44 1202 631817
Fax: 44 1202 631708

Downhole Solutions

Drilling Solutions

Engineering and Project Management Solutions

Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions